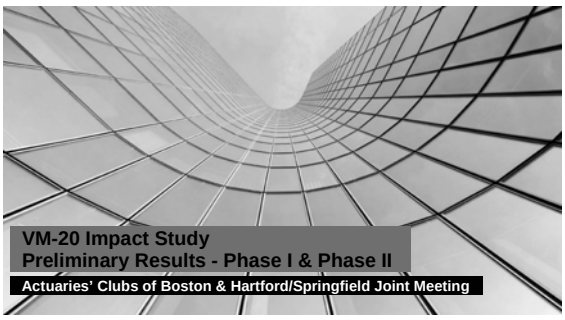

VM-20 Impact Study
Preliminary Results - Phase I & Phase II

Actuaries' Clubs of Boston & Hartford/Springfield Joint Meeting

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Draft, for discussion purposes only

Agenda

- Phase I Participation
- Phase I Baseline Results
- Phase II Participation
- Phase II Selected Sensitivity Results
- Potential areas for refinement
- Next steps

Phase I participation

Count of Products Being Tested in VM-20 Impact Study				
Product	**Orig. Count**	**Current Count**	**Phase I Submitted Count**	**Phase I Resubmissions**
ULSG	10	10	9	7
UL without SG	5	3	2	1
Term	13	13	13	6
TWL	5	5	5	3
SIWL	4	3	3	3
VUL	6	5	4	3
Total	**48**	**42**	**36**	**23**

- Resubmissions have not had a significant impact on the data
- Not all companies submitted all aspects of Phase I
- We did not get any submissions from Reinsurance and IUL participants

Summary impact of VM-20 on 5 years of business "Per $1,000's" are dollar weighted averages

	VM-20 Overall Impact ($M)	Face Inforce	CRVM Tot. Res.		VM-20 Alt 1 Reserve			VM-20 Alt 2 Reserve		
			Amt.	Per $1,000	Amt.	Per $1,000	Chg. from CRVM	Amt.	Per $1,000	Chg. from CRVM
Direct	SIWL	10,175	370	36.4	371	36.5	0%	370	36.4	0%
	Whole Life	287,945	6,755	23.5	6,755	23.5	0%	6,755	23.5	0%
	ULSG	109,600	9,767	89.1	11,954	109.1	22%	10,295	93.9	5%
	VUL	28,394	965	34.0	1,041	36.7	8%	982	34.6	2%
	Term 10	151,838	838	5.5	514	3.4	-39%	514	3.4	-39%
	Term 20	285,021	2,153	7.6	1,193	4.2	-45%	1,087	3.8	-50%
	Term 30	184,432	1,659	9.0	966	5.2	-42%	805	4.4	-52%
	Grouped Term	518,168	3,057	5.9	3,295	6.4	8%	3,086	6.0	1%
Net	SIWL	10,175	370	36.3	371	36.4	0%	370	36.4	0%
	Whole Life	283,985	6,706	23.6	6,706	23.6	0%	6,706	23.6	0%
	ULSG	76,320	9,656	126.5	10,356	135.7	7%	8,930	117.0	-8%
	VUL	9,786	804	82.2	800	81.7	-1%	781	79.8	-3%
	Term 10	94,832	667	7.0	326	3.4	-51%	326	3.4	-51%
	Term 20	210,736	2,052	9.7	968	4.6	-53%	879	4.2	-57%
	Term 30	136,977	1,631	11.9	872	6.4	-47%	727	5.3	-55%
	Grouped Term	324,205	2,388	7.4	2,932	9.0	23%	2,755	8.5	15%

Three companies provided us with both individual and grouped results for aggregation analysis

Total amounts tested at the three companies, 1 year of business, direct			
Level Term Period	Inforce	CRVM Reserve	VM-20 Reserve, Alt 1
Term10	29,801,087,337	57,693,385	65,775,007
+Term15	6,192,421,814	13,367,940	3,782,795
+Term20	46,385,008,159	161,548,146	101,052,578
+Term30	34,803,349,787	173,779,974	95,817,359
= Total (simple sum)	117,181,867,097	406,389,446	266,427,740
Total (one aggregate model run)			184,373,198 *

* This reduction of 31% is weighted by dollar and hence differs from the 26% seen below

Average reduction by company in VM-20 reserves due to aggregation	1 year of business		5 years of business	
	Direct	Net	Direct	Net
Credit spread alternative 1	-26%	-35%	-20%	-19%
Credit spread alternative 2	-28%	-34%	-25%	-24%

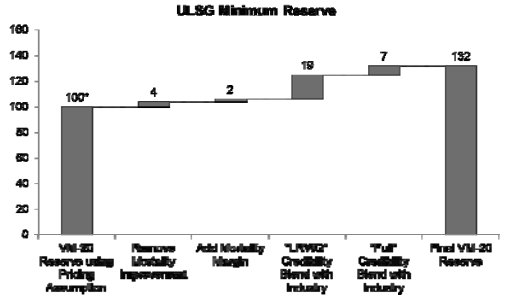
- After asking for more submissions, three participants have provided enough data for us to analyze the effect of aggregation
- In general, running individual LTPs together resulted in roughly a 25% decrease

Phase II Participation

	Sample Size Within Sensitivity																
	1	1.5	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Term	7	5	5	4	7	6	5	6	6		4	4	3		4	1	0	3
ULSG	6	4	2	2	4	3	1	4	4	4		3	3		3	1	1	3
ULWO	2	1	1	1	2	2	1	1	1			1	1		1	1	1	1
VUL	1	1	1	1	1	1	0	1	1			1	0		1	1	0	1
TWL	1	1	2	1	1	1	1	1	1			1	1		1	0	0	1
SIWL	1	0	3	1	1	1	2	1	1			0	1		1	0	0	1
$/Co. Weighted	$	$		Co.	$	$	Co.	Co.	$	$	Co.	Co.	Co.		Co.	Co.	Co.	Co.

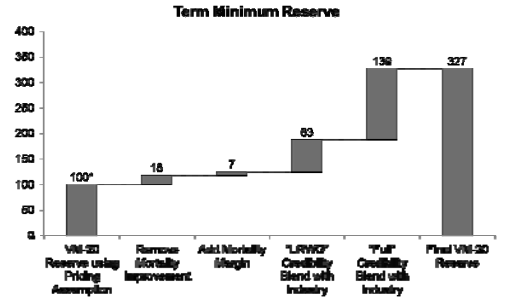
- Phase II sensitivities were only performed on a subset of the baseline established in Phase I testing, in particular, Phase II focused on:
  - Credit spread alternative 2
  - Five years of "new" business
  - Results net of reinsurance

Sensitivity 1
Mortality Margin Component Analysis



* Hypothetical starting reserve set to 100

Sensitivity 1
Mortality Margin Component Analysis (continued)



* Hypothetical starting reserve set to 100

Sensitivity 6
Net Premium Reserve (NPR)

- 6a) Change ULSG lapse rate formula in 3.C.3.c.ii from $L_{x+t} = 0.01R_{x+t} + 0.005(1 - R_{x+t})r_{x+t}$ to $L_{x+t} = 0.03R_{x+t} + 0.015(1 - R_{x+t})r_{x+t}$
  - Applies to ULSG only
  - Average change to ULSG NPR is -16%
- 6b) Change valuation rate from 5% to 4% for the no-CSV benefit streams, and from 4% to 3% for the with-CSV benefit streams
  - Applies to ULSG and Term only
  - Average change to Term NPR is +4%
  - Average change for to ULSG NPR is +23%
- 6c) Use VM-20 Section 3 to calculate the NPR instead of using CRVM
  - Applies to SIWL, TWL and ULWO only
  - Average change to SIWL NPR is -16%
  - Average change to TWL NPR is NR
  - Average change to ULWO NPR is -21%

Sensitivity 8
Lapse Rates

Deterministic Reserve	Lapse Rates -20%	Lapse Rates +20%
Term	14%	-13%
ULSG	4%	-4%
ULWO	9%	-5%
VUL	11%	-8%
TWL	5%	-7%
SIWL	NR	NR
Stochastic Reserve		
Term	-7%	24%
ULSG	5%	-4%
ULWO	NP	NP
VUL	-42%	30%
TWL	8%	-5%
SIWL	NR	NR
Minimum Reserve		
Term	-7%	24%
ULSG	5%	-4%
ULWO	0%	0%
VUL	6%	0%
TWL	0%	0%
SIWL	0%	0%

Sensitivity 9
ULSG Funding Patterns

Reserve	Premium acceleration	Premium deceleration	Premium to maintain SG
Deterministic Reserve	0.4%	-25.4%	10.3%
Stochastic Reserve	0.0%	-24.5%	13.0%
Minimum Reserve	0.3%	-24.1%	13.0%

- Premium acceleration multiplies each premium by 1.25 until secondary guarantee is fully funded
- Premium deceleration multiplies each premium by 0.75, causing many policies to fail the secondary guarantee

Sensitivity 11
Starting Assets

Deterministic Reserve	Starting Assets +10%	Starting Assets -10%
Term	0%	0%
ULSG	0%	1%
ULWO	1%	1%
VUL	NP	NP
TWL	-2%	-2%
SIWL	NP	NP
Stochastic Reserve		
Term	8%	-6%
ULSG	-9%	12%
ULWO	NP	NP
VUL	-3%	2%
TWL	-15%	29%
SIWL	NP	NP
Minimum Reserve		
Term	4%	-3%
ULSG	-2%	12%
ULWO	0%	0%
VUL	0%	0%
TWL	0%	0%
SIWL	NP	NP

Potential areas for refinement

- Scope and certification
- Mortality assumption
  - Credibility blending appears overly conservative
- Credit spread methodology
  - Alternative 1 or 2?
- Iteration of starting assets to within 2% of modeled reserve
  - Time consuming
- Net Premium Reserve
- Stochastic reserve exclusion test
  - Can be volatile when YRT reinsurance percentage is high

Next steps for impact study

- Online survey of participants
- Investigate outlier results
- Complete analysis to address NAIC objectives
- List potential refinements to VM-20
- Deliver final report
- Ongoing support